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Charge state dynamics of the nitrogen vacancy center in diamond under near-infrared excitation PENG JI, M. V. GURUDEV DUTT, University of Pittsburgh — The negatively charged NV defect center (NV-) in diamond has become prominent for applications in quantum information, nanoscale magnetic and electric field sensing, and fluorescent biological markers. Switching between NV- and neutral charge states (NV0) have been extensively studied and modeled using exciting laser wavelengths that are shorter than the NV- zero-phonon line (ZPL), and typically result in decreased fluorescence from the NV- state. In this work, we report on the experimental observation that NV0 converts to NV- under excitation with near-infrared (1064 nm) light, resulting in increased fluorescence from the NV- state. We have observed this effect in both ensembles of NVs in bulk diamond, and in diamond nanocrystals, and find that it is robust both at room and low temperature. We carried out microwave and two-color excitation combined with spectral and time-resolved experimental studies. We used rate-equation modeling and find evidence for competition between one-photon and two-photon processes for hole and electron ionization. This finding may help elucidate the study of the NV energy level structure, and impact recently emerging research in single-shot measurement of the NV- spin state via spin-to-charge conversion.

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